The rejection: Claims 17, 19 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Auhorn.

The above rejection is respectfully traversed.

Auhorn discloses a process for improving the printability of paper by applying an aqueous coating agent consisting of pigments and binders to one or both surfaces of the Auhorn paper and drying the coated paper, the mixture comprising:

(a) 100 parts by weight of a finely divided pigment;

(b) from 5 to 70 parts by weight, based on polymer, of a cationic aqueous polymer dispersion of a paper size, whose polymer has a glass transition temperature of 5° to 80°C., and

(c) from 0.01 to 10 parts by weight of a surfactant which interferes with the formation of the surface size, and/or of a polymeric dispersant used as a coating agent in an amount of 4 g/m^2. (Auhorn at column 1, line 65 to column 2, line 12).

Auhorn also discloses that up to 90, preferably, 5 to 30% by weight of the polymer component (b) can be replaced by a water-soluble polysaccharide (Auhorn column 2, line 12 to column 2, line 14), and although component (b) is a typical cationic surface size for paper, the sizing action of the size is virtually completely eliminated and, surprisingly, the printability of the paper thus treated is substantially improved (emphasis added) (Auhorn column 2, lines 16-18). This disclosure would seem to mean that polymer component (b), including a water-soluble polysaccharide does not act as a sizing agent.

In this regard, Applicants submit that Auhorn truly teaches that suitable polysaccharides are water-soluble starches, caroxymethylcellulose, methylcellulose, hydroxymethylcellulose and

galactomannanes (Auhorn column 7, lines 26-29), but Auhorn fails to teach or suggest the use of a sizing agent comprising water-soluble soybean polysaccharide extracted from soybean or soybean extraction residue which has been subjected to desalinating purification.

In the present invention, to enhance the fixing and color development of ink, it is preferable to add a cationic polymer to the sizing agent, particularly to fix the cationic polymer to the water-soluble soybean polysaccharide. The water-soluble soybean polysaccharide of the present invention presumably attracts the cation of the cationic polymer having a minus-charged main chain, resulting in pseudo-cross linking between the water-soluble soybean polysaccharide and the cationic polymer in the sizing agent as shown in Fig. 1 of the present application. When only a cationic polymer is coated, most of the cationic polymer permeates into the interior of the paper. In distinction, when a pseudo-cross-linked product of the water-soluble soybean polysaccharide and the cationic polymer is formed, the cationic polymer remains on the paper surface without penetrating inside the paper, resulting in an improvement in ink fixing and color development even with use of a small amount of the cationic polymer.

To demonstrate the unexpected differences between the water-soluble soybean polysaccharide of the present invention and the commercially available water-soluble polysaccharide disclosed in Auhorn in fixing and color development of ink on a paper surface and to show the unexpected advantage of the present invention over Auhorn, Applicants submit herewith a Declaration under 37 C.F.R. § 1.132 (executed).

Applicants would like to offer a few remarks on that DECLARATION, though it is believed that the DECLARATION is basically self-explanatory.

A raw paper having a basis weight of 70 g/m^2 was coated with a sizing agent having a composition shown in Table 1 by a bar coater in an amount of 5 g/m^2 on a solid basis, and dried at 120°C for 5 minutes in an oven.

In RUN No. 2 in Table 1, when CMC-Na was mixed with the cationic polymer, precipitation occurred, so that a sizing agent could not be prepared.

Table 1

Composition of Sizing Agent (parts by weight on a solid basis)

RUN No.	1(7)(*1)	2(*2)	3(*2)
Water-Soluble Soybean Polysaccharide	1.2(1)	1.2(2)	1.2(3)
Cationic Polymer(4)	1.2	1.2	1.2
Alumina(5)	0.6	0.6	0.6
Surfactant(6)	0.6	0.3	0.3
Water	96.7	96.7	96.7

Note:

(*1) EXAMPLE, which corresponds to EXAMPLE No. 7 in Table 1 of the specification.

(*2) COMPARATIVE EXAMPLE disclosed in the cited reference US Patent 4,908,204 to Auhorn et al., Column 7, lines 26-29.

(1) Tradename "Soyafive S-DN," available from Fuji Oil Co., Ltd.

(2) Carboxymethylcellulose-sodium, available from Daicel Chemical Industries, Ltd.

(3) Methylcellulose (water-soluble cellulose-ether), Trade name "SM-15," available from Shin-Etsu Polymer Co., Ltd.

(4) Viscous cationic polymer obtained by polymerizing a mixture of 70 parts by weight of N,N-dimethylaminoethyl acrylate*methyl chloride and 30 parts by weight of dimethyl acrylamide in a 15% concentration.

(5) Easily sinterable, low-sodium alumina (Tradename "AES-12," available from Sumitomo Chemical Co., Ltd.).

(6) Nonyl phenol ("Brownon N-509", HLB of 12.8 available from Aoki Oil Industrial Co., Ltd.).

Each recording paper obtained in RUN No. 1 and RUN No. 3 was used for full-color printing with an inkjet printer (color bubble jet printer "S600," available from Canon Inc.).

Printed samples were evaluated with respect to color development, water resistance, feathering, bleeding and ink fixation.

Color development was measured using a spectrophotometer ("NF-333" available from Nippon Denshoku Industries Co., Ltd.). Water resistance was evaluated by measuring (with the naked eye) the blurring of an image on a sample that was fixed at an angle of 45° immediately after printing, on which 750 μl of water was dropped.

Evaluation standards of water resistance were as follows:

◎ Completely no blurring.

O: Slight elution of ink into water, with no blurring of ink on the paper.

Δ: Slight blurring of ink on both surfaces of the paper.

X: Extreme blurring of ink on both surfaces of the paper.

In addition to color development and water resistance, feathering was evaluated by measuring (with the naked eye) image blurring of the portion of the fine lines of each printed chart.

Bleeding was evaluated by measuring (with the naked eye) image blurring between Red and Black and Yellow and Black, respectively.

Ink fixation was evaluated by slipping the fully black printed portion with a load of 40 g/m^2.

The results are shown in Table 2 below and in printed-papers (A) and (B) attached hereto.

Table 2 Results of Evaluation

No.	Color Development of Ink				Water Resistance
	Red	Yellow	Blue	Black	
EXAMPLE (A) (RUN No. 1	1.127	0.825	1.153	1.254	◎
COM. EX. (B) (RUN No. 3)	1.055	0.798	1.111	1.262	X

As is clear from Table 2 above, in EXAMPLE (A) using the sizing agent of the present invention, excellent color development was achieved in red, yellow and blue except for black. However, the difference of the measured values between EXAMPLE and COMPARATIVE EXAMPLE in the hundredths area is within measurement error.

Also, in EXAMPLE (A) coated with the sizing agent of the present invention, water resistance was improved greatly from that in COMPARATIVE EXAMPLE (B) coated with the available sizing agent.

The significantly advantageous feature of the sizing agent using the water-soluble soybean polysaccharide of the present invention over that of the sizing agent using the commercially available water-soluble polysaccharide in water resistance can be seen by comparing the backside surfaces of both printed-papers (A) and (B). In the backside surface of the printed-paper (A), no blurring of ink is seen.

With respect to the feathering, bleeding and ink fixation tests, printed paper (A) does not, at a quick glance, always appear to be superior to printed paper (B) in all of these three aspects. It is believed that one reason of such phenomena is due to the fact that the raw paper does not have an uniformly planed surface, i.e., the same was prepared on a laboratory scale without using the necessary additives and machinery which would be used in commercial mass production.

In conclusion, it is respectfully submitted that the attached DECLARATION establishes that the sizing agent of the present invention is unexpectedly superior to one made of a commercially available, water-soluble polysaccharide in ink concentration, color development, and water resistance upon recording paper use.

Accordingly, Applicants submit that one of ordinary skill in the art, referring to Auhorn, which Applicants respectfully submit does not teach a sizing agent comprising water-soluble soybean polysaccharide extracted from soybean or soybean extraction residue which has been subjected to desalinating purification, would not foresee the unexpected results achieved in

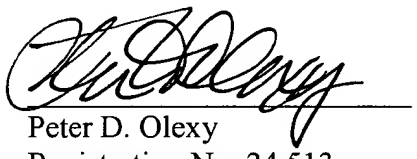
accordance with the present invention and, accordingly, claim 17 of the present application is not obvious over Auhorn.

It is believed that the patentability of claims 19 and 20 of the present application is established by the above remarks and the DECLARATION with respect to claim 17.

Withdrawal of the rejection and allowance is requested.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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